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START

0029334

Mr. John Grantham
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Department of Ecology
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FLUOR DANIEL, INC.

Date: May 14, 1992

Reference: Hanford Waste Vitrification Plant
DOE Contract DE-AC06-86RL10838
Fluor Contract 8457

Transmittal No.: WDOE-134

Dear Mr. Grantham:

TRANSMITTAL

We enclose 5 copy of the items listed below. These are issued per US-DOE request.

Response due to Fluor: N/A
Responds to: A900 PACKAGE

NUMBER	Rev.	Date	TITLE
B-595-A-A900			A900 PACKAGE SPECIFICATION READY-MIXED CONCRETE PRODUCTION AND DELIVERY

Distribution:
REFERENCE: FRP-412, FUP-141
R. L. Long: DOE-RL w/0
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P. Felise, WHC-RL (MSIN G6-16), w/1
Environmental Data Management Center
(MSIN H4-44), w/1 (H4-22)
D. Duncan, US EPA, Region X w/0

Very truly yours,

DR Kumin for
R. S. Poulter
Project Director

RSP:RWK:lt

9113594.0029

SPECIFICATIONS

READY-MIXED CONCRETE PRODUCTION AND DELIVERY (B-595-A-A900)

HANFORD WASTE VITRIFICATION PLANT

U.S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE

FLUOR DANIEL
ADVANCED TECHNOLOGY DIVISION
CONTRACT 8457

DOE CONTRACT NO.
DE-AC06-86RL10838

U.S. DEPARTMENT OF ENERGY
Hanford Waste Vitrification Plant
Richland, Washington
DOE Contract DE-AC06-86RL10838

FLUOR DANIEL, INC.
Advanced Technology Division
Fluor Contract 8457

READY-MIXED CONCRETE PRODUCTION AND DELIVERY (B-595-A-A900)

"APPROVED FOR CONSTRUCTION"

REVISION NO. 0
SAFETY CLASS 4
ISSUE DATE 5-12-92

APPROVED BY:

R. P. Kumar	Lead Structural Engineer	5-5-92 Date
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R. S. Poulter	Project Director	7 May 92 Date

READY-MIXED CONCRETE PRODUCTION AND DELIVERY
(B-595-A-A900)

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DIVISION 3 - CONCRETE

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SECTION 03346
READY-MIXED CONCRETE PRODUCTION AND DELIVERY

PART 1 GENERAL

1.1 SUMMARY

This Section covers the technical requirements for production of ready-mixed concrete and delivery to the Hanford Waste Vitrification Plant (HWVP) site. The ready-mixed concrete specified is applicable to Safety Class 1, 2, 3 and 4 buildings, structures and foundations.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. Except as modified by the requirements specified herein or on the contract drawings, work included in this specification shall conform to the applicable provisions of these publications.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T260	1984 Standard Method of Sampling and Testing for Total Chloride Ion in Concrete and Concrete Raw Materials

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 211.1	1989 Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete
ACI 211.2	1981 (R 1990) Standard Practice for Selecting Proportions for structural Lightweight Concrete
ACI 301	1989 Specification for Structural Concrete for Buildings
ACI 304R	1989 Guide for Measuring, Mixing, Transporting and Placing Concrete
ACI 305R	1989 Hot Weather Concreting
ACI 306R	1988 Cold Weather Concreting

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C33	1990 Standard Specification for Concrete Aggregates
ASTM C40	1984 Standard Test Method for Organic Impurities in Fine Aggregates for Concrete
ASTM C87	1983 (E1) Standard Test Method for Effect of Organic Impurities in Fine Aggregate on Strength of Mortar
ASTM C88	1990 Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C94	1990 Standard Specification for Ready Mixed Concrete
ASTM C109	1990 Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 Inch or 50 mm Cube Specimens)
ASTM C117	1990 Standard Test Method for Materials Finer than 75 Micrometer (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C123	1983 (E1) Standard Test Method for Light-weight Pieces in Aggregate
ASTM C127	1988 Standard Test Method for Specific Gravity and Absorption of Coarse Aggregates
ASTM C128	1988 Standard Test Method for Specific Gravity and Absorption of Fine Aggregates
ASTM C131	1989 Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	1984 (Rev. A) Standard Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C142	1978 Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM C150	1989 Standard Specification for Portland Cement

ASTM C173	1978 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C183	1988 Standard Practice for Sampling and the Amount of Testing of Hydraulic Cement
ASTM C191	1982 Test Method for Time of Setting of Hydraulic Cement by Vicat Needle
ASTM C231	1991 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	1986 Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C289	1987 Standard Test Method for Potential Reactivity of Aggregates (Chemical Method)
ASTM C295	1990 Standard Guide for Petrographic Examination of Aggregates for Concrete
ASTM C311	1990 Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete
ASTM C330	1989 Standard Specification for Light-weight Aggregates for Structural Concrete
ASTM C494	1990 Standard Specification for Chemical Admixtures for Concrete
ASTM C512	1987 Standard Test Method for Creep of Concrete in Compression
ASTM C535	1989 Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in Los Angeles Machine
ASTM C566	1989 Standard Test Method for Total Moisture Content of Aggregate by Drying
ASTM C618	1991 Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete

ASTM C845	1990 Standard Specification for Expansive Hydraulic Cement
ASTM D512	1989 Standard Test Method for Chloride Ion in Water
ASTM E329	1990 Evaluation of Testing and Inspection Agencies as Used in Construction

CORPS OF ENGINEERS

CRD C39	1983 Method of Test for Coefficient of Linear Thermal Expansion of Concrete

NATIONAL READY MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA QC 3	(Jan 1984; 4th Rev) Quality Control Manual: Section 3, Plant Certifications Checklist: Certification of Ready-Mixed Concrete Production Facilities

1.3 **RELATED REQUIREMENTS**

(Not Used)

1.4 **DEFINITIONS**

(Not Used)

1.5 **SYSTEM DESCRIPTION**

The system covered is a concrete batch plant and concrete delivery equipment sufficient to produce and deliver concrete over the construction period. The system also includes storage facilities for materials, and the ability to maintain detailed records of material quantities used and material tests performed.

1.6 **SUBMITTALS**

Submit the following in accordance with the Vendor Drawing and Data Requirements section of the Order/Subcontract.

1.6.1 Certification of batch plant and mixer trucks operation in accordance with Paragraph 3.2.1.2.

1.6.2 Proposed mix designs in accordance with Paragraph 2.3.

1.6.3 Material test reports specified in Paragraph 2.3.13.

1.6.4 Material test reports specified in Paragraphs 2.1 and 2.2.

1.6.5 Batch tickets in accordance with Paragraph 3.2.1.4.

1.6.6 Inspection records specified in Paragraph 3.3.2.

1.6.7 Test reports specified in Paragraph 3.3.3 and Table 2.

1.7 **CLASSIFICATION OF SYSTEM AND COMPONENTS**

(Not Used)

1.8 **PROJECT OR SITE ENVIRONMENTAL CONDITIONS**

The system must be capable of producing and delivering concrete in temperatures ranging from -4°F to 110°F.

PART 2 PRODUCTS

2.1 **CONCRETE MATERIALS**

2.1.1 Cement: ASTM C150, Type I or II, or ASTM C845, Type E-1, as noted in Table 1.

One brand of cement shall be used throughout the work to maintain uniform color.

Every shipment of cement shall be accompanied by a certified material test report stating the results of actual tests representing the cement in shipment and the ASTM C150 specification limits for each item of required chemical, physical, and optional characteristics as defined in Note 1 of Table 1. No cement shall be used in any structural concrete prior to receipt of 7 day mill test strengths.

2.1.2 Aggregates: ASTM C33 for normal weight concrete; ASTM C330 for lightweight concrete. Maximum aggregate size as noted in Table 1.

Tests for full conformance with ASTM C33 or C330, including tests for potential reactivity, shall be performed prior to use. See Paragraph 2.3.12 for special requirements for aggregate in concrete exposed to high temperature. Tests for conformance with ASTM C88, C131 and C289 shall be repeated whenever there is reason to suspect a change in the basic geology or mineralogy of the aggregates.

A daily inspection control program shall be carried out during concrete production to determine and control consistency in potentially variable characteristics such as water content, gradation, and material finer than No. 200 sieve. The Seller shall, as a minimum, perform the tests identified in Table 2.

2.1.3 Water and Ice: ASTM C94, Paragraph 4.1.3. Water and ice shall be clear and apparently clean and shall not contain more than 250 ppm of chloride as Cl ions as determined by ASTM D512. Water of questionable quality or recycled water shall be subject to the acceptance criteria of ASTM C94, Table 1. Wash water from mixer washout operations shall not be used for mixing concrete. Tests for full conformance to these requirements shall be performed prior to use.

2.2 **ADMIXTURES**

2.2.1 Air Entraining (AE): ASTM C260, chloride free. Product shall be "MB-VR" by Master Builders, Inc., "Air Mix" by The Euclid Chemical Co., or equal. When specified in Table 1, total air content shall be as specified in ASTM C94, Table 3 for "moderate exposure" when tested per ASTM C173 or C231.

2.2.2 Water Reducing (WR): ASTM C494, Type A, chloride free. Product shall be "Pozzolith 220-N" by Master Builders, Inc., "Eucon WR-75" by The Euclid Chemical Co., "Plastocrete 150" by Sika Chemical Corp., or equal.

2.2.3 High Range Water-Reducing (HWR): ASTM C494, Type F, chloride free. Product shall be "Rheobuild 1000" (Type F) by Master Builders, Inc., "Eucon 37" (Type F) by The Euclid Chemical Co., or equal.

2.2.4 Accelerating: Not allowed.

2.2.5 Calcium chloride or admixtures containing chloride from other than impurities from admixture ingredients shall not be used.

2.2.6 Tests for compliance with ASTM C260 and ASTM C494 are required prior to initial shipment or acceptance at the batch plant for use. An infrared spectrum trace of the conformance test sample of air-entraining, water-reducing and high range water-reducing admixture shall be furnished with the test results.

2.2.7 Fly-Ash (F-A): ASTM C618, Type F.

Every shipment of fly-ash shall be accompanied by a certified material test report stating the results of actual tests representing the fly-ash in shipment and the ASTM C618 specification limits for each item of required chemical and physical characteristics.

2.2.8 See Table 1 for usage of admixtures. The admixtures for air-entraining, water reducing and high range water reducing should preferably be from the same manufacturer.

2.3 MIX DESIGNS

2.3.1 Mix designs shall be identified and classified as follows:

Class ST - Structural Concrete

Class MC - Mass Concrete

Class SC - Shrinkage Compensating Concrete

Class M - Miscellaneous Concrete (also for Underground Duct Banks)

Class LW - Light Weight Concrete (110-115 pcf)

Class G - Grout (Pourable)

2.3.2 The basic mix design identification is additionally identified with numbers, 1, 2, etc. for varying maximum aggregate sizes when appropriate.

2.3.3 The basic mix design identification is also additionally identified with the letter "P" for "plasticized" concrete.

2.3.4 Mix designs shall satisfy the requirements of Table 1.

2.3.5 Mix designs shall be established on the basis of laboratory trial mixtures in accordance with ACI 301 Section 3.9.3.3 for a required average strength which exceeds f'_c by 1200 psi. Selection of proportions shall comply with ACI 211.1 for normal and mass concrete and ACI 211.2 for lightweight concrete.

2.3.6 The required average strength may be reduced after sufficient field data is available in accordance with ACI 301 Section 3.11, if approved by the Buyer.

2.3.7 For mix Classes ST, MC and SC, the minimum dry density shall be 147 pounds per cubic foot for concrete without air entrainment and 144 pounds per cubic foot for concrete with air entrainment.

2.3.8 For lightweight concrete, the air-dry and fresh unit weight per cubic foot shall be correlated per ACI 301 Section 3.12.1.

2.3.9 The maximum water soluble chloride ion (Cl) concentration in hardened concrete at 28 days shall not exceed 0.15 percent by weight of cement. Testing for water soluble chloride ion content shall conform to AASHTO T260. Test samples shall be obtained from the compressive test cylinders used to verify laboratory trial mixtures.

2.3.10 The proposed mix design for each class of concrete and all supporting test data including chemical admixtures used shall be submitted in writing to the Buyer for authorization to proceed. All laboratory tests shall be performed by an independent testing agency qualified in accordance with ASTM E329. Field adjustments to the approved materials and mix designs shall not be allowed without prior written approval by Buyer.

2.3.11 For mixes requiring fly ash, a maximum of 25 percent of cement by weight may be replaced by fly ash unless specified otherwise in the Contract Specifications or Drawings. Use all of the fly ash in calculating water-cement ratio. Fly ash may be used as a cement replacement in all other mixes (maximum of 15 percent of cement by weight) at the option of the Seller except where prohibited in the Contract Specification or Drawings.

2.3.12 All admixtures shall be added in accordance with manufacturer's instructions.

2.3.13 Mix design Classes MC3P and MC4P are intended for use in a long term high temperature exposure, up to 200°F (Canister Storage Building Vault). Aggregates shall be basalt aggregates as found in the Hanford area. Petrographic examination in accordance with ASTM C295 of the proposed coarse and fine aggregates is required to identify the principal rock types and mineral contents. Results of the petrographic examination shall be submitted to the Buyer for approval.

Three concrete cylinders for each of the proposed mix designs shall be prepared. These cylinders shall be used to determine the coefficient of thermal expansion in accordance with CRD C39 except that the cool bath temperature shall be 70°F and the warm bath temperature shall be 180°F. The results shall be submitted to the Buyer for approval.

PART 3 EXECUTION

3.1 PREPARATION

(Not Used)

3.2 INSTALLATION, APPLICATION AND ERECTION

3.2.1 Concrete Production and Delivery

3.2.1.1 The batch plant, including storage facilities, and delivery trucks shall meet the requirements of ASTM C94 and ACI 304R Chapters 2, 3, and 4.

3.2.1.2 The batch plant, including storage facilities, and delivery trucks shall be certified as capable of producing quality concrete. A "Certificate of Conformance for Concrete Production Facilities" as issued by the NRMCA QC 3 shall be submitted to the Buyer prior to batching any concrete materials.

3.2.1.3 The Seller shall be fully responsible for the quality of the concrete, up to the discharge end of the delivery equipment chute.

3.2.1.4 The Seller shall furnish with each batch of concrete before unloading at the site, a delivery ticket preprinted with Buyer's name and project name showing:

A. Serial number of ticket,

B. Date,

C. Truck number if applicable,

D. Class of concrete,

E. Amount of concrete,

F. Amount of cement and fly ash,

G. Information necessary to calculate total mixing water added (free water on aggregates, water, and ice batched at plant, and water added by truck operator from mixer tank),

H. Type, brand, and amount of admixtures,

I. Weights of fine and coarse aggregate,

J. Time loaded or of first mixing of cement and aggregates,

K. Reading of revolution counter at the first addition of water,

L. Reading of revolution counter at the time of the start of placement of the load of concrete,

M. Unique location identification as provided by the structure number and concrete placement number,

N. Water added by receiver of concrete and his initials,

O. Signature or initials of ready-mix representative.

3.2.2 Cold Temperature Concreting

When conditions are such that the ambient temperature may be expected to be 40°F or below during placing of concrete or when ordered by the Buyer, Seller shall conform to the requirements of ACI 306R Chapter 3. Seller shall maintain the temperature of the concrete at the points of delivery equipment discharge at not less than 50°F for concrete sections 3 feet or less in the least dimension and not less than 45°F for concrete sections over 3 feet.

3.2.3 High Temperature Concreting

When conditions are such that the ambient temperature may be expected to be 90°F or above during placing of concrete or when ordered by the Buyer, Seller shall conform to the requirements of ACI 305R Chapter 3. Seller shall maintain the temperature of the concrete at the points of delivery equipment discharge at 70°F or less for sections over 3 feet in the least dimensions and 90°F or less for sections 3 feet or less.

3.3 **FIELD QUALITY CONTROL**

3.3.1 The Buyer reserves the right to acquire the services of an independent testing and inspection agency to inspect the batch plant, including storage facilities and delivery equipment, and to perform tests as is deemed necessary to assure quality of materials and concrete produced and being delivered.

3.3.2 The Seller shall, as a minimum, perform inspection to verify that all equipment furnished is in compliance with the technical and quality requirements of this section. Any failure to meet the requirements shall be corrected. Inspection records shall be furnished for the following items:

3.3.2.1 At intervals not exceeding 90 days, the truck water meter and revolution counters shall be inspected and calibrated prior to placing concrete.

3.3.2.2 At intervals not exceeding 90 days, the batch plant mixers and mixer trucks shall be visually examined to detect changes in condition due to accumulation of hardened concrete and examined to detect wear of blades. Mixer blades shall be replaced when they have lost 10 percent of their original height in accordance with NRMCA QC 3. Restrictions shall conform to the requirements of ASTM C94.

3.3.2.3 At intervals not exceeding 90 days, all scales, volumetric devices, and dispensers of the batch plant shall be inspected and calibrated.

3.3.3 The Seller shall, as a minimum, perform the tests identified in Table 2 to verify compliance with the requirements of Part 2 of this Section. Reports of testing shall be submitted to the Buyer.

3.4 **ADJUSTMENTS**

(Not Used)

3.5 **CLEANING**

(Not Used)

3.6 **PROTECTION**

(Not Used)

3.7 **DEMONSTRATION**

(Not Used)

3.8 **SCHEDULES**

(Not Used)

END OF SECTION

TABLE 1

Mix Class[6]	f'_c 28 Days (psi)	Slump		Max. W/C Ratio[3]	Cement Type	Max. Agg. Size (in.)	Admixture[6]
		Initial (in.)	Final[4] (in.)				
ST1	4000	2-4		0.50	I or II	1-1/2	AE, WR
ST2	4000	2-4		0.50	I or II	3/4	AE, WR
ST1P	4000	2-4	7-9	0.45	I or II	1-1/2	AE, HWR
ST2P	4000	2-4	7-9	0.45	I or II	3/4	AE, HWR
MC1	4000	2-4		0.50	II[1]	1-1/2	F-A, AE, WR
MC2	4000	2-4		0.50	II[1]	3/4	F-A, AE, WR
MC1P	4000	2-4	7-9	0.45	II[1]	1-1/2	F-A, AE, HWR
MC2P	4000	2-4	7-9	0.45	II[1]	3/4	F-A, AE, HWR
MC3P	5000[7]	2-4	7-9	0.45	II[1]	1	F-A, HWR
MC4P	6000[7]	2-4	7-9	0.45	II[1]	3/4	F-A, HWR
SC1	4000	2-4		0.50	E-1	1-1/2	AE, WR
SC2	4000	2-4		0.50	E-1	3/4	AE, WR
SC1P	4000	2-4	7-9	0.45	E-1	1-1/2	AE, HWR
SC2P	4000	2-4	7-9	0.45	E-1	3/4	AE, HWR
M	2500	3-6		0.50	I or II	3/8	
LW	3000	2-4		0.50	I or II	3/8	
G	4000	Note[2]		Note[2]	I or II	Sand	

(1) Maximum heat of hydration @ 7 days = 70.0 calories/gram.

(2) Use minimum water necessary to achieve pouring consistency.

(3) Water to cement (W/C) ratio is by weight.

(4) Final slump is after addition of HWR to the truck mixer. Initial slump is specified for information only for preparing mix design. Testing of initial slump is not required for plasticized concrete mixes.

(5) See Section 2.3 for mix class definitions.

(6) See Section 2.2 for admixture abbreviations.

(7) Concrete strength (f'_c) is to be determined at 90 days.

TABLE 2

INSPECTION AND TESTING OF CONCRETE

MATERIAL AND REQUIREMENT	TEST METHOD	TEST FREQUENCY
Concrete		
Mixer uniformity	ASTM C94	Initially and every 6 months thereafter
Chlorides	AASHTO T260	Every 6 months[1]
Aggregate		
Gradation	ASTM C136	Once daily during production of concrete
Moisture content	ASTM C566	Daily during production of concrete
Material finer than No. 200 sieve	ASTM C117	Daily during production of concrete
Organic impurities in sand	ASTM C40	Weekly during production of concrete[1]
Organic impurities strength of mortar	ASTM C87	Test only if organic compounds as determined in accordance with ASTM C40 are present
Friable particles	ASTM C142	Monthly during production of concrete[1]
Lightweight pieces	ASTM C123	Monthly during production of concrete[1]
Los Angeles abrasion	ASTM C131 or C535	Every 6 months[1]
Potential reactivity	ASTM C289	Every 6 months[1]
Soundness (sodium sulfate; at 5 cycles)	ASTM C88	Every 6 months[1]
Specific gravity and absorption	ASTM C127 or C128	Every 6 months[1]
Petrographic	ASTM C295	Every 6 months[1]

MATERIAL AND REQUIREMENT	TEST METHOD	TEST FREQUENCY
Water and Ice		
Compressive strength	ASTM C109	Every 6 months[2]
Setting time	ASTM C191	Every 6 months[2]
Chlorides	ASTM D512	Every 6 months[2]
Fly Ash		
Chemical and physical properties	ASTM C618 ASTM C311	Each 200 tons received
Cement		
Standard physical and chemical properties	ASTM C150 ASTM C183	Each 1000 tons received

(1) These test frequencies may be longer periods as approved by the Buyer, when the test data establishes confidence that conformance with specification is being met.

(2) For recycled or questionable water, the test frequency shall be every month until the test data establishes confidence that water meets the conformance requirements.